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PTO/SB/33 (07-09)
Approved for use through 07/31/2012. OMB 0851-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

PRE-APPEAL BRIEF REQUEST FOR REVIEW

Docket Number (Optional): CU-4560

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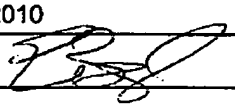
on April 1, 2010

Signature: 

Typed or printed name: Eric D Babych

Application Number	Filed
10/560,804	December 15, 2005

First Named Inventor: Jawad Haidar

Art Unit	Examiner
1793	Zhu, Weiping

Applicant requests review of the final rejection in the above-identified application. No amendments are being filed with this request.

This request is being filed with a notice of appeal.

The review is requested for the reason(s) stated on the attached sheet(s).
Note: No more than five (5) pages may be provided.

I am the

- ☐ applicant/inventor.
- ☐ assignee of record of the entire interest. See 37 CFR 3.71. Statement under 37 CFR 3.73(b) is enclosed. (Form PTO/SB/96)
- ☑ attorney or agent of record. Registration number 57542
- ☐ attorney or agent acting under 37 CFR 1.34. Registration number if acting under 37 CFR 1.34 _____

Signature

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312-427-1300
Telephone number

April 1, 2010
Date

NOTE: Signatures of all the inventors or assignees of record of the entire interest or their representative(s) are required. Submit multiple forms if more than one signature is required, see below*.

☑ *Total of 2 forms are submitted.

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Docket: CU-4560

Examiner: Zhu, Weiping
Art Unit: 1793

Pre-Appeal Brief Request for Review

The claims in the present application, U.S. Serial No. 10/560,804, have been at least twice rejected. Based upon the assertions made in the Office Action mailed January 5, 2010, (hereinafter "the Office Action"), Applicant respectfully asserts that the rejections of record are clearly improper and based upon errors in facts. Moreover, Applicant respectfully asserts that a *prima facie* case of obviousness under 35 U.S.C. §103(a) cannot be established due to the omission of essential elements that are required to establish the *prima facie* case. Accordingly, pre-appeal review is respectfully requested.

In the Office Action, Claims 1-7, 11-26, 31, 32, 36-40, 45, 52-55 and 62 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nie et al. (US 2004/0050208). Claims 8-10 are rejected under 35 U.S.C. 103(a) as being unpatentbale over Nie et al. in view of O'Donnell et al. (US 5,397,375).

The presently claimed invention relates to the surprising discovery that if $TiCl_4$ is reduced with aluminum under controlled conditions and in a stepwise manner via titanium subchloride intermediates, then useful products can be obtained (see, e.g. the description between line 18 on page 7 and line 5 on page 8 of the PCT specification (as amended under Article 34)).

The invention defined by the pending claims is a stepwise method comprising a first step in with $TiCl_4$ is reduced using aluminum at a temperature to trigger reactions to form intermediates including titanium subchlorides and aluminum chloride. Subsequently, a second step is preformed in which the products of the first step (with the addition of more aluminum if required) are heated to form the desired titanium-aluminum compound and/or titanium-aluminum alloy.

Applicant indicates that the pending claims clearly recite (a) that the reduction of $TiCl_4$ proceeds via two steps, (b) that the $TiCl_4$ (and titanium subchlorides) is reduced with aluminum, and (c) that titanium subchloride intermediates are formed in the first step.

At the time the presently claimed invention ("the invention") was made, Applicant respectfully asserts that it was well known in the art that $TiCl_4$ could be reduced using

aluminum metal (or many other metals). However, Applicant asserts that it was also well known that such a reaction would proceed in an uncontrollable manner and result in incomplete reaction and the formation of an uncontrollable composition of compounds (see pages 3 and 4 of the specification of the present application). The state of the art is, for example, discussed in references listed on pages 3 and 4 of the specification of the present application, which were disclosed to the US Patent and Trademark Office in an Information Disclosure Statement on or about May 9, 2006. The state of the art is also mentioned in paragraph [0066] of Nie *et al.*, as discussed below.

To support a *prima facie* case of obviousness, the Office Action must establish "a finding that the prior art included each element claimed, although not necessarily in a single prior art reference, with the only difference between the claimed invention and the prior art being the lack of actual combination of the elements in a single prior art reference." Examination Guidelines for Determining Obviousness Under 35 U.S.C. 103 in view of *KSR International Co. v. Teleflex Inc.*, 72 Fed. Reg. 57,526 (Oct. 10, 2007).

Applicant asserts that Nie *et al.* does not teach or suggest a method that includes at least elements (a), (b) and (c) of the pending claims. Applicant asserts that that Nie *et al.* teaches that a "precursor material" is reduced by a "reducing gas" to form an elemental material. Nie *et al.* specifically describes a process in which $TiCl_4$ is directly reduced to titanium metal using hydrogen gas. The reaction between $TiCl_4$ and hydrogen results in the formation of elemental titanium and hydrogen chloride gas. The hydrogen chloride gas is subsequently reacted with a "reductant material" (e.g. Al, Mn, Mg, Na, Ca, K, Li, Ba, Be, Ce, Cs, Hf, Pa, Rb, Sr, Th, U or Zr) to form hydrogen for future use, and reductant chloride vapour (e.g. $AlCl_3$ vapour, if Al is the "reductant material"). The reason that aluminum (or any of the numerous other "reductant materials") is used in the method disclosed in Nie *et al.* is to continuously drive the reaction between $TiCl_4$ and H_2 by removing one of the reaction products (i.e. HCl).

Applicant asserts that Nie *et al.* does not teach or suggest a method of producing titanium-aluminum compounds and/or alloys in which aluminum is used as the reductant. Applicant further asserts that Nie *et al.* does not refer to the formation of intermediates during the reaction between $TiCl_4$ and H_2, let alone the titanium subchloride intermediates

explicitly recited in the pending claims. Indeed, the method of Nie *et al.* could not possibly produce the intermediates recited in the pending claims, because aluminum is not involved in the reduction of $TiCl_4$ to Ti. Applicant further asserts that Nie *et al.* does not teach or suggest a stepwise process for reducing $TiCl_4$. As is clearly stated in (for example) paragraph [0064], the reaction proceeds via the reactions represented by Formulae V and VI, in which $TiCl_4$ is directly reduced to Ti using H_2.

Accordingly, Applicant asserts that at least features (a), (b) and (c) of the presently claimed method are not taught or suggested in Nie *et al.*, and thus, a *prima facie* case of obviousness cannot be established in view of this reference.

Not only is Nie *et al.* silent regarding the aforementioned features, Applicant respectfully asserts that it clearly teaches away from using Al as a reductant. Page 3 of the Office Action asserts that "the mere disclosure of alternative designs [in Nie *et al.*] does not teach away," from the presently claimed invention. However, Applicant is not arguing that because Nie *et al.* discloses alternative designs, it teaches away from the present invention. Applicant respectfully asserts that throughout Nie *et al.*, $TiCl_4$ is only ever described as being reduced using a reducing gas. Paragraphs [0062] to [0066] describe the advantages of using a reducing gas such as H_2 compared to using a metal (e.g. aluminum or manganese) for reducing the precursor material. Paragraph [0063] mentions that thermodynamic calculations indicate that $TiCl_4$ can be reduced by Al or Mn. However, Applicant asserts that paragraphs [0062] and [0066] clearly indicate that this is not a practical option. Indeed, paragraph [0066] acknowledges that state of the art (as discussed above) by stating "...as persons skilled in the art know, if $TiCl_4$ is reduced solely by a metal, the newly-born titanium metal and the produced metal halide, most of which is solid or liquid under preferred operating conditions, will form simultaneously on the surface of the reductant metal and be physically trapped by one another." Paragraph [0062] indicates that reductant metals (such as Al) have relatively small thermodynamic driving forces and states that "These small thermodynamic tendencies...which leads to the very slow reaction rate or no reaction at all." Applicant asserts that this clearly teaches that reduction of $TiCl_4$ with Al would result in an incomplete reaction and the formation of an uncontrollable mixture of products. It is due to the foregoing teachings that Applicant

considers Nie *et al.* to teach away from the present invention and not merely because Nie *et al.* may disclose "alternative designs" as mentioned in the Office Action.

It appears that the outstanding Office Action has not appreciated the state of the art, and has mischaracterized the teachings of Nie *et al.*, and this has led to various errors in fact in the Office Action. Applicant respectfully asserts that one of ordinary skill in the art would not seek to reduce $TiCl_4$ with Al because, as previously mentioned, it is well known in the art that this reaction would not result in the formation of useful products. Indeed, paragraphs [0062] and [0066] of Nie *et al.* clearly teach that Al is an unsuitable reductant.

In particular embodiments described in Nie *et al.* (see e.g. paragraphs [0069] to [0073]), a "seed" may be included in the first reaction in order to form an "alloy of elemental materials." In one embodiment, the precursor material is $TiCl_4$ and the seed is Al, and the process results in the formation of Ti-Al alloy. However, Applicant indicates that in all of the methods disclosed in Nie *et al.*, the reduction of the precursor material is always caused by the reducing gas. In the embodiments involving a seed material, the reduced precursor material (e.g. Ti that has been reduced from $TiCl_4$ by H_2) deposits on the seed material (e.g. Al) to form an alloy with the seed material (see paragraph [0069]). Thus, the seed material does not reduce the precursor material. In this respect, Applicant indicates that paragraphs [0060] to [0065] of Nie *et al.* clearly teach that if aluminum is present when the $TiCl_4$ is reduced with H_2, it would not react because H_2 is much more reactive than Al metal.

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In view of the foregoing, Applicant respectfully asserts that the rejections of record are clearly improper and based upon errors in facts. Moreover, Applicant respectfully asserts that a *prima facie* case of obviousness under 35 U.S.C. §103(a) cannot be established due to the omission of essential elements that are required to establish the *prima facie* case.

Respectfully submitted,

April 1, 2010
Date

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